Sunflowers Add Variety to the Great Plains

The land is desolate between wheat crops in the central Great Plains. Traditionally, farmers leave the soil bare every other year because there isn't enough water for an annual crop. The average rainfall in this area is only 16.5 inches a year.

With the help of research, however, farmers are increasingly finding ways to delay fallow to every third or fourth year.

They do this by leaving crop residues in place after harvest. This reduces evaporation and stores more precipitation in the soil for the next crop.

But crops need to be rotated to minimize disease and pest problems. Sunflowers could be one of these new crops for the central Great Plains, earning farmers money while protecting soil from blowing away in spring winds that easily exceed 30 miles per hour.

David C. Nielsen, an agronomist with the Agricultural Research Service in Akron, Colorado, finds that if sunflower stalks are left about 30 inches high after harvest, they almost completely prevent soil loss. When the inevitable winter blizzards arrive, the beheaded stalks act like snow fences, trapping 3 to 10 times more snow than would normally accumulate.

"When this snow melts, it replenishes 3 to 9 inches of soil water," Nielsen says. "Depending on snowfall amounts and wind speeds, this can recharge about 30 to 95 percent of the water sunflowers use, making the practice worthwhile for farmers. They should earn more money, even when yields of wheat or other rotated crops are lower because of the water used by the sunflowers."

Nielsen says sunflowers dry a soil out down to 6 feet in the Great Plains. "But that's good because as the sunflowers use the water that is too deep to be used by other crops, they also capture nitrogen, reducing chances of groundwater pollution.

"While wheat may dry a soil down to 8 percent moisture by volume, sunflowers dry it down to 3 or 4 percent," he says.

Nielsen has found that yields are best when sunflowers are rotated in every 4 years rather than every 3. "We think that's because growing sunflowers less frequently breaks disease and pest cycles. And without disease, there's a greater chance of the sunflower stalks standing up through the entire winter and next spring."

Rotating in other crops like sunflowers also helps farmers diversify.

"They're not so tied to weather conditions in a particular year," Nielsen says. "This year's a good example. There was a drought while winter wheat was growing. Then, wouldn't you know it, it rained as soon as the wheat was harvested, and rainfall was better than average when the sunflowers were planted and grown."—By **Don Comis,** ARS.

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Topsoil Is Alive: Keep It Fresh

As anyone finds after moving into a newly built home, a yard full of "sterile" subsoil is a poor substitute for healthy topsoil when it comes to growing a lawn, shrubs, or a garden. Topsoil brims with worms, microorganisms, and organic matter. Subsoil—material from below the topsoil—usually spells subpar greenery.

Mining companies face a similar problem when reclaiming strip-mined Western rangeland. But their problem is far more serious: Federal and, often, state laws require them to replant and establish native vegetation. New research points to a way to give their efforts a better chance of success.

While rangeland vegetation like sagebrush may look tough, it's delicate. The plants need all the help they can get from the soil.

"Anything that helps plants tolerate drought is critical in the arid and semiarid West, especially in disturbed, reclaimed soils," says soil scientist Gerald E. Schuman, who is with the Agricultural Research Service. "Disturbing the soil—digging, piling, spreading, and compacting it—destroys soil pores that hold water."

Mining companies, he notes, typically salvage and store topsoil as long as several years. They put it back only after they finish mining a site.

But Schuman and colleagues at the University of Wyoming at Laramie found that native vegetation is so needy that mining companies should return topsoil no more than a few months after it is removed.

Recently, the scientists learned why: Beneficial root-dwelling fungi die off in topsoil stored too long. The fungi, called mycorrhizae, have hairlike filaments that funnel water and nutrients to roots, helping plants survive drought.

The scientists learned about the mycorrhizae's role in a greenhouse study. The soil came from the site of a coal mine in northeastern Wyoming. In fresh and sterilized batches of this soil, they planted seed of Wyoming big sagebrush—a species that must be replanted by mining companies if it was present before disturbance.

The seedlings grown in fresh, fungi-rich topsoil survived 3 to 5 days longer when the soil was allowed to dry. "This could be just the time needed to tide them over until the next rain," says Schuman, who is in the ARS Rangeland Resources Research Unit at Cheyenne, Wyoming.

He recommends that topsoil stockpiling be limited to the start of mining operations and for no more than a few months.

"After that it should, whenever possible, be salvaged and respread where needed in a single process."—By **Don Comis,** ARS.

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